

REMARKS/ARGUMENTS

Applicant has carefully reviewed and considered the Examiner's Action mailed May 30, 2003. Reconsideration is respectfully requested in view of the foregoing amendments and the comments set forth below. By this Amendment, claims 1, 5 and 8 are amended, claims 2-4 are canceled and new claim 17 is presented. Accordingly, claims 1 and 5-15 are pending in the instant application.

Claim 7 was objected to because there was insufficient antecedent basis for the limitation, "the housing", in the claim. Claim 1, from which claim 7 indirectly depends, has been amended to positively recite a housing. Accordingly, it is believed that claim 7 has sufficient antecedent basis for the term "the housing" and withdrawal of this objection is respectfully requested.

Claims 1-3 were rejected under 35 U.S.C. § 102(e) as being anticipated by U.S. Patent No. 6,088,085 to Wetteborn as explained in paragraph 4 of the Action. This rejection is considered moot in that independent claim 1 includes the features of dependent claims 2, 3 and 4.

Claims 4-13 and 16 were rejected under 35 U.S.C. § 103(a) as being unpatentable over Wetteborn as explained in paragraph 6 of the Action. This rejection is respectfully traversed.

As explained in the Request for Reconsideration filed on April 30, 2003, Applicant's invention is directed to an optoelectronic apparatus that provides the highest possible precision in determining the distance of an object and that provides the most reliable verification of objects in the monitored region (page 4, paragraph 7 of the instant specification). As explained on page 6, paragraph 13 of the originally filed specification, one cause of internal measurement errors is that the emission of a transmission light pulse does not occur simultaneously with the actuation

of the transmitter due to a trigger pulse or similar mechanism. That is, known prior art devices may emit the transmission light pulse with a slight delay due to the finite transit time of the electrical signals in the individual components. Applicant's claimed optoelectronic apparatus provides reliable in the highest possible precision in determining the distance of an object with a transmitter that emits transmission light that is guided into a monitored region, a diverting unit that periodically guides transmission light pulses into the monitored region, means for coupling out a portion of the light quantity of a transmission light pulse as a reference transmission pulse so that for each diversion of a transmission light pulse by the diverting unit, a reference transmission light pulse is coupled out of the transmission light pulse; a receiver that receives reflected light including transmission light pulses reflected by an object in the monitored region and respective reference transmission light pulses which are guided by way of a reference path to the receiver; a housing having an exit window wherein the transmitter, the receiver and the diverting unit are situated in the housing so that the transmission light pulses diverted at the diverted unit are guided into the monitored region by way of the exit window and wherein the coupling-out means is a reflection surface disposed at the exit window; and an evaluation unit connected to the transmitter and the receiver. The reflection surface reflects a portion of the light quantity of the transmission light pulses as the reference transmission light pulse which is reflected back to the receiver.

Contrary to the system claimed by Applicant, Wetteborn is directed to range measurement apparatus, which does not disclose, teach or suggest the claimed diverting unit, as discussed below, and employs a unit 5 which delays a light signal. It is the Action's position that a housing in which the claimed transmitter, receiver and diverting unit are situated "would have

been a mere matter of obvious design choice". The Action further states that "beam dividing mirror (19) serves to couple out a portion of the light transmitted by laser diode (17) as a reference beam (14)." It is respectfully submitted that beam dividing mirror is not a diverting unit as claimed by Applicant. Wetteborn positively recites that "beam dividing mirror 19 has ...a very high degree of transmission, so that light extending along the optical axis of laser diode 17 can pass largely **unhindered** through the beam dividing mirror 19." (Emphasis provided, column 5, lines 16-20 of Wetteborn). That is, Wetteborn teaches that beam dividing mirror 19 allows the transmission light to pass through the beam dividing mirror, without being diverted, unless it is coupled-out as a reference light beam (14) (another required element of claim 1). Webster's New World Dictionary defines "divert" as "turning (a person or thing) aside from a course, direction, etc. into another; deflect". It is respectfully submitted that the beam dividing unit 19 disclosed by Wetteborn teaches away from the claimed diverting unit that periodically guides the transmission light pulses into the monitored region. Since Wetteborn expressly teaches that the beam dividing mirror 19 has a very high degree of transmission so that light can largely pass through beam dividing mirror 19 unhindered, beam dividing mirror (19) does not turn (a person or thing) aside from a course. Accordingly, Wetteborn is missing the claimed diverting unit and teaches against such a feature as discussed above.

Moreover, the coupling of the reference beam in Wetteborn is involved and requires a complicated mechanical design. For the reference beam decoupling, the transmitter must be integrated into a housing in which a beam-divided mirror is also installed. This increases the manufacturing cost of the range measurement apparatus. Also, as stated above, the light pulse must be coupled into a fiber-optical wave guide and through a unit 5 that delays the light signal

and also produces a mode mixing. In contrast, the coupling-out means of the reference light beam according to the claimed invention requires a much less complicated design. A reference light is coupled out of the transmission light pulse via a reflection surface 14 at the exit window of the housing. This can be realized easily and cost-effectively thereby reducing the manufacturing cost of the optoelectronic apparatus for detecting objects in a monitored region.

As the Action admits, Wetteborn does not disclose a housing with an exit window where the coupling-out means is a reflection surface disposed at the exit window. The Action baldly asserts that "such is known and would have been a mere matter of obvious design choice in order to protect the components of the device and to also provide a way to produce a reference pulse." Thus, the Action fails to disclose a reference that teaches such a coupling-out means and it is only Applicants' own disclosure that describes a simple, inexpensive coupling-out means to provide a reference transmission light pulse that is reliable and effective.

In addition, the claimed reflection surface of the coupling-out means may extend approximately over the complete width of the exit window in order to provide a uniform reference light coupled-out for each deflection position of the diverting unit 8. This feature is recited in new dependent claim 17.

With respect to claim 8, the Action admits that Wetteborn does not disclose the claimed evaluation unit. While memory devices may be known, claim 8 involves quantizing the light pulse amplitudes and reading the same into predetermined registered positions so that the transit-time difference is determined as the difference of the register positions of the reflected light pulse and the reference reflected light pulse. Nowhere does Wetteborn or any of the cited references teach employing position registers to determine transit-time. Accordingly, it is

believed that one of ordinary skill in the art would not have been motivated to modify Wetteborn's range measurement apparatus that admittedly does not employ the claimed evaluation unit. Accordingly claim 8 should be allowable over Wetteborn.

Dependent claim 12 recites a particularly advantageous variant where the transit-time differences are computed from the center of gravity of quantized light pulses. Since Wetteborn determines a transit-time, there is no motivation to modify its teachings in the absence of a reference teaching the features of claim 12. Accordingly, claim 12 is patentable over the teaches of Wetteborn.

The Action is correct in saying that a motor and an optical intenuator (11) are provided in Wetteborn for adjusting the amplitudes and pulse widths of the light pulses to predetermine values, which is the precondition for an error-free distance measurement. However, an adjustment of this type is not required for the device according to the invention and claimed in independent claim 8 and dependent claim 12. This is a considerable advantage since the motor control according to Wetteborn is not all only undesirably involved, but also entails a certain inertia that does not permit a fast reaction to changes in the amplitudes and pulse times of light pulses. Disadvantages of this type do not occur with the claimed invention.

Nowhere does the prior art of record describe an optoelectronic apparatus or system as claimed by Applicant. It respectfully submitted that Wetteborn teaches against the approach taken by Applicant. Accordingly, it is believed that claims 1, 5-13 and 16-17 should not be rendered obvious by the teachings of Wetteborn.

Claims 14-15, which depend directly or indirectly from claim 1, were rejected under 35 U.S.C. §103(a) as being unpatentable over Wetteborn in view of U.S. Patent No. to Bölkow as described in paragraph 7 of the Action.

Bölkow is directed to a method of measuring the distance of a target and an apparatus for its performance. Nowhere does Bölkow disclose, teach or even suggest the claimed diverting unit that is missing by independent claim 1 as discussed above. While Bölkow discloses a change-over switch 10 that diverts light pulses either to a reference light or to a target object 17, Bölkow, like Wetteborn, discloses a complicated and more expensive design to provide a reference light. Accordingly, it is respectfully submitted that Bölkow can not teach or suggest a reflection surface disposed at the exit window to reflect a portion of the light quantity of transmission light pulses as a reference transmission light pulse back to the receiver as presently claimed in independent claims 1. Accordingly, Bölkow in any combination with Wetteborn can not render the claimed invention obvious.

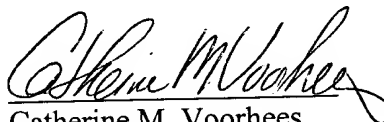
In view of the foregoing amendments and remarks, it is respectfully submitted that claims 1 and 5-17 are patentable over the art of record because neither Wetteborn nor Bölkow disclose, teach or even suggest the claimed diverting unit and the claimed reflection surface disposed at the exit window in order to reflect a portion of light quantity of the transmission light pulses as a reference transmission light pulse back to the receiver. Accordingly, Applicant request the issuance of a Notice of Allowability indicating that claims 1 and 5-17 are allowable over the prior art of record.

Appl. No. 09/916,231
Amdt. Dated August 29, 2003
Reply to Office Action of May 30, 2003

Should the Examiner believe that conference would advance the prosecution of this application, the Examiner is requested to telephone the undersigned counsel to arrange such a conference.

Date: August 29, 2003

Respectfully submitted,



Catherine M. Voorhees
(Registration No. 33,074)
VENABLE LLP
Post Office Box 34385
Washington, DC 20043-9998
Telephone: (202) 962-4800
Direct dial: 202-962-4084
Telefax : (202) 962-8300

CMV/elw
DC2/477274